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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/687,585
Filing Date: October 20, 2003
Appellant(s): MONTFORT ET AL.

Stephen R. Valancius
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 10-9-02007 appealing from the Office action mailed 2-6-2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,944,761	HEIBERG	8-1999
6,089,507	PERVEZ ET AL.	7-2000

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 15 and 16 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. There is no mention in the original disclosure about the length of the elongate members.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 8, 10, 12, and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Heiberg, 5,944,761.

As per claim 8, Heiberg discloses a plurality of elongated deployable members on line 35, on column 2; an attitude control system (figure 1) comprising: a gyroscopic actuator that supplies torque to the satellite when the satellite is subjected to a disturbing force or torque on lines 25-55, on column 2; a control system that receives

signals representing a current attitude of the satellite and the controls the gyroscope actuator to supply a correction torque based on a difference between the current attitude of the satellite and a predetermined set attitude for the satellite on lines 15-67, on column 2; wherein the gyroscopic actuator is one of a plurality of gyroscopic actuators, each one controlled by the control system to supply torque to maintain the predetermined attitude on line 28, on column 2, the "CMGs" refer to multiple, hence the "s"; the control system comprises an attitude regulation loop, including a corrector such that the bandwidth of the loop contains the lowest and most energetic frequencies of flexible modes of the elongated members and the attitude regulation loop provides a control signal to control the gyroscopic actuators on lines 30-38, on column 2. Since the system discloses controlling vibration from solar panels it must inherently have a bandwidth that contains the lowest and most energetic frequencies of the elongated members. Otherwise, it would not operate correctly.

As per claim 10, Heiberg discloses the corrector of the loop is synthesized by means of advanced system control methods in figure 1. The term advanced system control methods is never clearly defined and reasonable interpretation would include the filter of Heiberg.

As per claim 12, Heiberg discloses inherently the way gyroscopes operate. The limitation is a description of how gyroscopic actuators all work.

As per claim 13, Heiberg discloses inherently the necessary torque for maintaining the predetermined set attitude is based on the precession tendency of one or more of the gyroscopes. As admitted in the arguments by the Applicant filed on 3-9-

06, gyroscopic actuators are known to change the attitude of a satellite through precession.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 4, 6, 14, 15 and 16, are rejected under 35 U.S.C. 103(a) as being unpatentable over Heiberg, 5,944,761.

Heiberg discloses the limitations as set forth above with respect to claims 8, 10, 12, and 13. Heiberg does not disclose the satellite is a geostationary satellite or the elongated members have a fixed length. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the invention of Heiberg in a geostationary satellite because geostationary satellites suffer from sudden temperature variations when appearing from night to day, or day to night as they rotate with the earth and Heiberg provides a way to compensate for the vibrations that can accompany these temperature fluctuations and fixed length elongated or elongate members would be a design choice based on the mission need.

Claims 5, 7, 9, and 11, are rejected under 35 U.S.C. 103(a) as being unpatentable over Heiberg, 5,944,761 as applied to claims 4, 8, and 10 above, and further in view of Parvez et al., 6,089,507.

Heiberg discloses the limitations as set forth above, and the filter 125 is an attenuation filter. Heiberg does not disclose the corrector is a PID corrector and is associated with an attenuations filter; the advanced control method is one of H-infinity and Linear Matrix Inequality methods. Parvez et al. teaches using H-infinity and PID in attitude control of a satellite on lines 8-16, 45-55, on column 2, lines 8-16, on column 2. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use and of the control theories of Parvez et al. in the invention of Heiberg because it is a design choice and one of ordinary skill in the art would be readably able to choose a control theory to best match the current situation. For instance, PID is generally simpler to implement but is not as robust as H-infinity.

(10) Response to Argument

Ground 1

Appellant argues that figure 1 shows that the solar generators 12 and 14 (elongate members) are fixed length and that one of ordinary skill in the art would understand that the solar generators and/or antennas described in the present application are a fixed length. This argument is not convincing since from a drawing it is impossible to tell if the elongate members are a fixed length. Drawings cannot easily show movement since they are only a representation of a single point in time. Also, throughout the specification (for instance page 4, line 4) the elongate members are described as being deployable. One of ordinary skill in the art would interpret this to mean that in the case of solar generators that they can be unfurled and varied in length. In the case of an antenna, one of ordinary skill would assume that this means the

antenna can be extended and again varied in length. Besides citing a drawing (which really doesn't prove anything is fixed), Appellant cannot show a single instance in the specification that supports the limitation of a "fixed" length elongate member.

Ground 2

Appellant's arguments to ground 2 center on whether Heiberg discloses a corrector with a bandwidth of the loop containing the lowest and most energetic frequencies for the flexible modes of the elongate members. More specifically, the arguments concentrate on the frequencies of the corrector. A simple description of how such a system works will probably be helpful. Satellites with outstretched members can have problems maintaining a pointing direction when these outstretched members start to oscillate due to a disturbance. A disturbance can be the thrusters firing or thermal variances in the outstretched members. An example of this discussed in Heiberg is when satellites move from a shadow into direct sunlight. In such an instance, solar generators (panels) in particular can "snap" from thermal stress and cause an oscillation in the panel at some frequency. This frequency is a function of the length of the panel and the stiffness of the materials used in the panel. A good way to picture this is by considering a 20ft. length of 1" PVC pipe or conduit. If you hold this pipe in the center and move it up and down the two ends of the pipe will flop around at a certain rate. Now, if you cut this piece of pipe in half and then shake it the same way the ends of the pipe will shake at a much higher rate (the frequency of the disturbance increases). This would continue with smaller and smaller lengths of pipe to a point where it would almost seems that the pipe ends don't flop at all, but what really happens

is that the ends move so little and so fast that we wouldn't be able to perceive it. Solar generators (panels) can act like that first long floppy piece of pipe and this property is an inherent feature of the panels. To correct for such movement control moment gyroscopes (CMGs) are used to counteract the motion of the solar generators. The bandwidth of the corrector is where in the frequency spectrum the controller will look for disturbances to correct. If the bandwidth doesn't include the frequency at which the solar generators are moving, then the controller would not activate the CMGs to counteract the movement and pointing problems for the spacecraft would result.

Heiberg discloses two systems for dealing with disturbances that are caused by the elongate members of a satellite. The first system is the conventional control of the prior art and the second is his improvement which works with members that are changing length and thereby changing the frequency of the disturbance. It should be noted that the rejection relied upon only the first conventional system and not the second system even though Appellant argues the second system.

Heiberg discloses in his description of the prior art (the first system) a system that will compensate for "the snapping of solar panels due to sudden temperature variations" (see column 2, lines 15-62). Appellant argues that Heiberg doesn't disclose correcting for the "lowest and most energetic frequencies of the flexible modes of the elongated members" but Heiberg clearly does because Heiberg is canceling or nulling out the rocking of the solar panels caused by the temperature variations. While Heiberg may not use the words "lowest and more energetic frequencies" these frequencies are an inherent result of the geometry and physical properties of the solar panels.

It should also be noted that Appellant never actually goes into detail about the "lowest and most energetic frequencies of the flexible modes of the elongated members." Nowhere in the specification does the Appellant give any type of range or exact values for the frequencies that he is dealing with. So using the broadest reasonable interpretation of the terms, the frequencies that Heiberg discloses controlling can very easily be interpreted as the "lowest and most energetic frequencies of the flexible modes of the elongated members."

Appellant argues the second system of Heiberg even though that system was not cited for the rejection, but those arguments are similarly not convincing. In particular, on page 12 of the brief the Appellant argues that figure 2 of Heiberg shows that the lowest frequencies of the disturbance are not corrected for by pointing to the graph 116. However, the smaller peaks in the graph of 116 are never described and it is not clear where they would be coming from. For all we know, these small peaks are measurement error, a natural function of the system design, or part of a disturbance that has nothing to do with the elongated members. Appellant provides no basis for assuming that these peaks have anything to do with the elongated members. It should also be noted that Appellant's argument that Heiberg only deals with vibrations that change frequency with time is also not convincing since Heiberg discloses on lines 15-18, on column 5, that his improvement (second system) also works with fixed frequency disturbances.

Appellant finishes his arguments for ground two by citing case law which deals with inherency. This case law provides more support for the examiner's position rather

than helping Appellant's arguments. The various case law, in general, requires that the inherent feature be required in the invention being described. In this instance, Heiberg requires that the "lowest and most energetic frequencies of the flexible modes of the elongated members" be included in their corrector otherwise the invention would simply not work and perform its intended function. Heiberg's (the first system) intended function is to cancel out disturbance from solar panels. If the system doesn't include the frequencies at which the panels oscillate, the system just wouldn't work. On page 14 of the brief, the Appellant makes an argument about other possibilities for how Heiberg might work. This argument states that the bandwidth of Heiberg may contain other frequencies and provides Markley as evidence. However, this argument is not convincing because Markley does disclose including the lowest and most energetic frequencies. Appellant fails to understand the when Markley states the controller has a bandwidth of .1 Hz and doesn't excite the first significant flexible mode of the solar array they are stating that they are preventing resonance and the controller from causing a disturbance (the control itself could cause a disturbance if not properly accounted for). The spacecraft motion controller is designed to compensate from a controller bandwidth (.1Hz noted above) up to 5 Hz. This range includes the range disclosed by Markley as including the first significant flexible mode of the solar array which is disclosed as being between .5 and 1.0 Hz.

Ground 3

These arguments rely on the above arguments and are not convincing for the same reasons.

Ground 4

These arguments rely on the above arguments and are not convincing for the same reasons.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Brian J. Broadhead

/Brian J. Broadhead/

Examiner, Art Unit 3664

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